

**INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES (IHRA)
STATUS REPORT OF THE ADVANCED OFFSET FRONTAL CRASH PROTECTION
WORKING GROUP**

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ABSTRACT

This paper will provide an overview of the work progress of the advanced offset frontal crash protection group of IHRA. It resumes, including tables and a final flow chart, the strategy of the group to cope with the assigned task. This is the commitment to achieve an harmonised frontal crash protection procedure taking into account the different world wide views in this field.

INTRODUCTION

At the ESV Government Focal Point Meeting on International Harmonised Research Agenda held in Melbourne in May 1996, six research fields on passive safety were highlighted as the ones in which harmonisation efforts could be most fruitful.

The leadership of future activities in each field was assigned to a specific country.

In particular the E.U. accepted the leadership in the field of Frontal Collision Safety.

The aim of the Working group is to develop internationally agreed test procedures designed to improve the car structures in order to cope with the event of frontal collision thus enhancing the level of occupant protection provided in frontal impacts. Such task shall be accomplished defining shared unified injury criteria and, if needed, geometrical criteria on common basis.

There is a shared world wide common term of reference: the collision of two equal cars. Parameters of testing, such as tools, are diverging. Indeed the differences related to the use of different barriers (deformable/stiff barrier) and dummies are substantial. Differences among countries in the selection of testing procedures may be attributed to the different infrastructures and data banks. Thus regulations are diverging as a consequence of these discrepancies.

It has to be remarked that basically two main developing tendencies on frontal collision standard are present:

- 1) In Europe the Parliament has given mandate to the European Commission to review the present Directive on Frontal Collision (Deformable barrier, 40% overlap, impact speed, some geometrical and biomechanical parameters).
- 2) In the USA the Congress has given mandate to NHTSA to go through a short/medium term activity to verify the possibility to finalise a standard which could be harmonised with the European one.

Furthermore, a long term activity has been devoted to the development of a specific USA frontal impact test carried out with a mobile deformable barrier.

WORK PROGRESS OF THE GROUP

The analysis of the differences started considering the common and the diverging aspects of the main items. Since the first meeting, the activity in progress devoted to the assessment of the different frontal impact procedures nowadays used in Europe and USA was examined. Such procedures are different in terms of impact speeds and barrier.

During the discussion items and distinguishing characteristics of miscellaneous existing standards, on which activities are in progress, were pointed out, particularly in the USA, where researches using different barrier types with different impact speeds are carried out.

Furthermore this country has remarkably developed in this research activity, the connections among different risks displayed by using dummies different by 50thile male, on which base the vehicle structure is tailored (50thile female and 95thile male dummies).

To this research, Canada get ahead on the topic of the dummy/Air-Bag interaction. On this side Canada has given a great contribution complementary to the US researches.

On the base of such characteristics the work has been splitted in two phases, which are corresponding to the short and long term part of the programme.

Work programme.

1 - 1ST Phase (short term programme)

A board to define the main aspects was drawn by the group members. On each of these the participants of the group engaged their self to develop specific activities and to give out results.

Accordingly, the table with the topics of interest has been established by the group as follows:

Table 1
Topics of interest

WORKING MATTER	USA	CAN	EEVC	J	AUS
Trolley	X				
Types of barriers	X	X			X
- stiff	x	x			X
- deformable	x	x			X
Impact angle	X				
Dummy	X	X	X		X
- 5 th %ile female	x	x			X
- 95 th %ile male	x	x			
Impact speed	X	X	X		X
Performance criteria	X	X	X		X
- footwell intrusion	x		x		X
- steering wheel intrusion	x		x		
- abdomen injury detection		x			
- arm injury		x			
Air-Bag performance	X	X			X
- Deployment time & effects.		x			
Extension to vehicle of category N1.			X		

1.1 Commitments

During the discussion, the American delegate declared that NHTSA is planning in the first stage approach to study in the short term the potential benefits of the EEVC frontal test procedure under the US conditions. It appears that the EEVC test procedure may offer advantages to the USA if used with a 5th%ile female dummy, based on the dummy transducer readings in some preliminary tests. If the first stage (adoption of a modified EEVC test procedure) proves to have not potential benefit for the USA, the first stage would be abandoned and work would concentrate on the second stage.

EEVC confirmed that is going toward the solution of a fixed barrier getting on legs biomechanical criteria and higher impact speed.

1.2 Schedule time

The group devoted to this first phase the scope and the goals, remarking that the work program has to be finalised within five years and it should be set into the following deadlines:

1. ESV Windsor Conference

Presentation of the first report which contains the determination of research specific aspects and the working program launching focused on the drawing up of a technical standard on frontal crash protection.

2. End 1999/beginning 2000

Completion of the technical standard project and validation programme launching.

3. ESV 2001

Work completion and technical standard project presentation to the ESV conference.

2 - 2nd Phase (Long term programme)

According to the NHTSA and EEVC work plan and in order to better define the American and the European approaches, the group agreed the bases of a comparative analyses of the advantages of the use of a mobile barrier in the Frontal Offset impact test procedure and the alternative approach to achieve the same advantages with fixed barriers.

The main points of the comparison are pointed out in the following table:

Table 2.
Trolley-based Frontal Offset Impact Test Procedure

ADVANTAGES	ALTERNATIVE APPROACH TO ACHIEVE SAME ADVANTAGE WITH FIXED BARRIER
1. Takes into account the effects of the Mass Ratio of the impacting vehicles	Change impact speed with vehicle mass.
2. Can include angular effects on the deformation and intrusion characteristics	No known alternative.
3. Can include a possible measure of Compatibility (by, for instance, measuring the vehicle and/or trolley acceleration	Measure the force on the fixed barrier behind the deformable face.
4. The acceleration pulse, ΔV and energy distribution is 'correct'.	No known alternative.
DISADVANTAGES	POSSIBLE ACTIONS TO REDUCE THE DISADVANTAGE
1. Complex test procedure for "moving barrier-moving car" (High speed trolley vibrations, difficulties to videorecord impact effects between mobile trolley and car)	Reduce complexity by testing co-linearly and/or using moving barrier to stationary car?
2. Repeatability of more complex test may be poor (for "moving barrier-moving car").	
3. Limited number of test laboratories with capability to perform trolley to vehicle testing.	Investigate
4. Unknown ground and other interaction effects, especially if one vehicle stationary while the other travels at higher speed – to represent both vehicles moving.	?
5. Need to agree on a harmonised barrier mass when vehicle fleet differs.	Agree to differ

2.1 Commitments

USA would concentrate on the second stage approach, which regards the Trolley-based Frontal Offset Impact Test Procedure, in case the first one will not produce any potential benefits.

EEVC will undertake the research programme in the second stage, by assessing the following items:

1. the potential benefits of using a mobile barrier
2. provide indications of possible modifications to the present EU test procedure based on the European accident studies.

2.2 Schedule time

The group has not yet resumed the deadlines of this second stage because premature.

PROBLEM DEFINITION

FIND KEY CHARACTERISTICS

TEST METHOD

